

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)

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Applicant's or agent's file reference 032666wo/Me/sto	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP 03/12517	International filing date (day/month/year) 10.11.2003	Priority date (day/month/year) 08.11.2002
International Patent Classification (IPC) or both national classification and IPC B01J20/32, G01N30/48, B01D15/08, B01J20/00		
Applicant NEXTTEC GMBH et al.		



1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 12 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 26.05.2004	Date of completion of this report 03.05.2005
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I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-23 as originally filed

Claims, Numbers

1-23 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

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III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos. 13,16,17,19

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 13,16,17,19 are so unclear that no meaningful opinion could be formed (*specify*):

see separate sheet

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos.

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the Standard.

☐ the computer readable form has not been furnished or does not comply with the Standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-12,14,15,18,20,21,22,23
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-12, 14,15,18,20,21,22,23
Industrial applicability (IA)	Yes: Claims	1-12,14,15,18,20,21,22,23
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1.1 The present claims have been drafted in eight separate independent claims 1, 12, 13, 16, 18, 20, 21, 22. The two method claims 12 and 13 for obtaining the sorbent material are in the same category.
The aforementioned claims 12 and 13 therefore lack conciseness and as such do not meet the requirements of Article 6 PCT.

Moreover, claim 13 is related to a method for obtaining a sorbent material according to claim 1 to 11 which comprises a solid support. However claim 13 does not mention that a deposition step of the reaction product is being carried out on a solid support. This leads to an ambiguity and renders claim 13 unclear, as furthermore no support for the presence of this step in the wording used in the part of the description related to this embodiment (see page 6, line 14 to 26 of present application) appears to be present.

Hence, claim 13 does not fulfill the requirements of Article 6 PCT.

An opinion with regard to novelty, inventive step and industrial applicability can therefore not be given for claim 13.

1.2 Claim 16 relates to a method for separation of substances using the sorbent material according to claims 1-11 in a separation process. From this claim, it is not clear how the process is carried out as there is no process steps present.
Therefore, claim 16 does not fulfill the requirements of Article 6 PCT.

Claims 17 and 19 which depends on the unclear claim 16 are as such also not clear and do not fulfill the requirements of Article 6 PCT.

An opinion with regard to novelty, inventive step and industrial applicability can therefore not be given for claims 16, 17 and 19.

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

2 Reference is made to the following documents:

- D1: DATABASE WPI Section Ch, Week 199807 Derwent Publications Ltd., London, GB; Class A89, AN 1998-075292 XP002277064 & RU 2 080 905 C (BIOORGANIC CHEM INST) 10 June 1997 (1997-06-10)
- D2: WO 01/96556 A (PROMETIC SCIENCES) 20 December 2001 (2001-12-20)
- D3: US-A-5 079 155 (G.B. COX) 7 January 1992 (1992-01-07)
- D4: WO 00/41807 A (MIRA DIAGNOSTICA GMBH) 20 July 2000 (2000-07-20)
- D5: US-A-4 160 728 (J.J. KIRKLAND) 10 July 1979 (1979-07-10)
- D6: US-A-5 522 994 (J.M.J. FRECHET) 4 June 1996 (1996-06-04)

In response to the applicant's letter of 2 February 2005 received on 3 February 2005, the International Preliminary Examining Authority (IPEA) has established that the present claims do not fulfill the requirements of the PCT for the following reasons:

3 Inventive step

3.1 The applicant acknowledges in his letter (see page 2, lines 18-19) that D1 may be regarded as closest prior art concerning claim 1 as well as claim 12 of the present application.

In its first communication, the IPEA referred to the WPI abstract of D1 and to the original patent document.

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The WPI abstract in combination with the teaching of the chemical formula in the original patent document (see page 3) disclose the following:

A silica support which is first treated with a vinyl methyl dichlorosilane.

The wording used in present claim 1 does not exclude that a support is first treated before being modified with the fluorinated polymer which is subsequently covalently attached to the support.

Hence, this intermediate product is interpreted as the solid support mentioned in claim 1 of present application.

The WPI abstract and the chemical formula on page 3 of the original patent document teach that a trifluorostyrene monomer is polymerised and covalently attached to the silica support treated with the vinyl methyl dichlorosilane.

Thus, D1 discloses a support substantially modified with a fluorinated polymer coating which is covalently attached to the support.

Therefore, the difference of claim 1 with regard to D1 is that the fluorinated polymer contains at least one functional group.

The wording "..... the support is substantially modified with the fluorinated polymer coating which is covalently attached to the support..." of claim 1 can also be interpreted in such a way that the fluorinated polymer coating is considered as being covalently attached to the support through a binding group such as the vinyl methyl dichlorosilane of document D1. As the vinyl methyl dichlorosilane of D1 is covalently attached to the silica support, the difference, with this interpretation of claim 1, between claim 1 and D1 is also that the fluorinated polymer contains at least one functional group.

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The applicant considers that the technical problem with regard to D1 is the provision of an improved chromatographic material in which the polymer coating is bound more tightly to the support core material.

However, this problem cannot be solved by the above mentioned difference as the at least one functional group contained in the polymer does not participate in the chemical binding of the fluorinated polymer to the support (see description of present application, page 4, lines 1-3 and page 6, lines 4-14).

Therefore, this distinguishing feature cannot be seen to make any contribution to the solution of the technical problem presented by the applicant in his letter, and is not relevant for assessing inventive step. The presence of a functional group on the fluorinated polymer is considered merely as a normal option which is obvious to the man skilled in the art. Hence, for this reason, the subject-matter of claim 1 cannot involve an inventive step in the sense of Article 33(3)PCT if the problem to be solved is considered as to provide an improved chromatographic material in which the polymer coating is bound more tightly to the support core material.

Furthermore, the IPEA already mentioned in its previous communication that the problem to be solved, when considering D1 as closest prior art, may be regarded as providing a sorbent composite of a solid support with a covalently attached fluorinated polymer coating which:

- a) enables a better wetting of its surface (see description of present application page 4, lines 1 to 3) or
- b) enables a further chemical modification of its surface and with that the optimisation of selectivity of the sorbent (see description of present application page 6, lines 11-13)

When considering this problem, the IPEA maintains that the solution proposed in claim 1 of the present application, i.e. the presence of at least one functional group on the fluorinated polymer coating cannot be considered as involving an inventive step (Article 33(3) PCT). As a matter of fact, in the technical field of sorbent materials, it is part of the general technical knowledge and therefore obvious to the man skilled in the art to

introduce a functional group in a polymer in order to enable a further chemical modification of this polymer and with that the optimisation of the selectivity of a sorbent which would contain this polymer.

In order to achieve a better wetting of a polymer surface, it is also part of the general technical knowledge and therefore obvious to the man skilled in the art to introduce functional groups in the polymer.

Furthermore, the introduction of pendent functional groups through the addition of comonomers containing this pendent functional groups is known from D2 (see page 3, lines 22-28 and page 4, lines 29-34) to facilitate the attachment of ligands to fluorinated polymers and to optimise therewith the selectivity.

In order to solve this particular problem, the man skilled in the art would not only consider documents related to composite sorbents comprising a core and a polymer coating but also documents related to sorbents composed only of polymers containing fluorine without cores such as in D2.

The teaching of D2 would therefore be used and combined with D1 in order to solve the problem of enabling a further chemical modification of a fluorinated polymer and with that the optimisation of the selectivity of a sorbent.

Therefore, the subject-matter of claim 1 cannot involve an inventive step in the sense of Article 33(3) PCT if the problem to be solved is considered as being:

providing a sorbent composite of a solid support with a covalently attached fluorinated polymer coating which:

- a) enables a better wetting of its surface (see description of present application page 4, lines 1 to 3) or
- b) enables a further chemical modification of its surface and with that the optimisation of selectivity of the sorbent (see description of present application page 6, lines 11-13)

3.2 Furthermore, notwithstanding the lack of clarity mentioned here below under paragraph

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4, the subject-matter of claim 12 does not involve an inventive step in the sense of Article 33(3) PCT, and therefore the criteria of Article 33(1) PCT are not met for the following reasons:

D1 discloses that a fluorine containing monomer, i.e. trifluorostyrene is added under γ -irradiation and under vacuum to the silica support which has been treated with a vinyl methyl dichlorosilane. This γ -irradiation generates surface radicals on the support which has been treated with the vinyl methyl dichlorosilane.

The method of obtaining a sorbent material in claim 12 differs therefore from document D1 in that a second monomer having at least one olefinic moiety and at least one additional functional group is subsequently introduced.

As already mentioned here above and contrary to what the applicant seems to suggest in his letter, the problem to be solved cannot be considered as to provide a method for obtaining an improved sorbent having a polymer coating which is bound more tightly to the support core material. As a matter of fact, this problem is already inherently solved in D1 which teaches that γ -irradiation generates surface radicals on the support allowing the polymerisation of fluorine containing monomer(s), i.e. trifluorostyrene. The process in D1 produces then a coating of a fluorine containing polymer on the support, the polymer being tightly bonded to the support as it is covalently attached.

The introduction step of a further monomer having at least one olefinic moiety and at least one additional functional group results in a block copolymer being formed with the first fluorine containing monomer(s). This further step does not contribute to the polymer being more tightly bonded to the support.

Therefore, the subject-matter of claim 12 does not involve an inventive step in the sense of Article 33(3) PCT when considering the above mentioned problem.

For claim 12, the problem to be solved with regard to D1 may also be regarded as providing a method for obtaining a sorbent material having a support coated with a fluorinated polymer which:

- a) enables a better wetting of its surface (see description of present application page 4, lines 1 to 3) or
- b) enables a further chemical modification of its surface and with that the optimisation of selectivity of the sorbent (see description of present application page 6, lines 11-13).

In order to provide such a method, the man skilled in the art would contemplate the introduction of a further monomer having at least one olefinic moiety and at least one additional functional group for modifying a first block of polymerised fluorine containing monomers without exercising any inventive skill. As a matter of fact, it is part of the general knowledge in the field of polymers that one of the method for modifying a polymer to enable further chemical modification or render it hydrophilic is through the preparation of a block-copolymer by introduction of a further monomer with functional or hydrophilic groups. The man skilled in the art would also apply this knowledge with respect to a core support material which is coated with a fluorinated polymer.

Hence, the subject-matter of claim 12 does not involve an inventive step in the sense of Article 33(3) PCT when considering this other problem.

3.3 The features of claims 2, 6, 7, 8, 15, 18 and 21 are known from document D1 (see Derwent abstract and page 3, right column, lines 5-10 of the original document). The subject-matter of these claims is therefore obvious because they do not appear to contribute to solving the problem of present application.

Document D2 (see page 4, lines 8-10 and page 10, line 17) discloses the features of claim 9 and 14 where hydroxyl functional groups are present in the fluorinated polymer and acrylic or methacrylic acids are used as second monomers.

Moreover, the features of claims 3, 22 and 23 have been disclosed in document D3 (see col. 4, lines 66-67 and col. 9, lines 7-25) which teaches an organic material such as polyethylene or polystyrene being used as solid support for fluorinated polymers and a miniaturized device in the form of a silicon semi-conductor for detecting bioorganic compounds.

The features of claim 4 and 5 are known from D9 (see col. 2, lines 42-49 and col. 6, lines 57-60; col. 7, lines 10-15) and D10 (see col.5, lines 8-15) where a silica sorbent having a bidisperse distribution of the pore sizes is disclosed for use in chromatography.

The features of claim 20 are disclosed in D7 (see page 4, lines 9-15 and lines 21-23) which describes a membrane-like device comprising a similar sorbent material embedded in a polymeric matrix.

Therefore, the subject-matter of claims 3, 4, 5, 9, 10, 11, 14, 20, 22 and 23 do not involve an inventive step in the sense of Article 33(3) PCT because they do not appear to contribute to solving the problem of present application.

4 Certain observations on the international application

4.1 In his letter (see page 2, lines 2 and 4), the applicant acknowledges that the subsequent post-polymerization of the fluorine containing monomer(s) is initiated by stable radicals **at gradual heating of the system** under conditions described in the examples, the radicals having been generated at the surface of the support by γ -irradiation or other ways. In this same letter (page 2, line 11), the applicant refers also to example 1 where such a heating takes place. Therefore, the **gradual heating** appears to be a feature which is essential for achieving the post-polymerisation of fluorine containing monomer(s) and obtaining thereby the sorbent according to claim 1. However, no such feature is present in the method claim 12.

Hence, claim 12 does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

4.2 The term "substantially", mentioned on the second line of independent claim 1 is

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relative and it is not clear (Article 6 PCT) what should be intended.

4.3 "(di)alkylamine" in claim 14 and page 7, line 1 is an obvious error and should be replaced by diallylamine as indicated in example 4, page 9 of the description.